

ABSTRACT OF THE INVENTION

A method of stabilizing nuclear material is disclosed. Oxides or halides of actinides and/or transuranics (TRUs) and/or hydrocarbons and/or acids contaminated with actinides and/or TRUs are treated by adjusting the pH of the nuclear material to not less than about 5 and adding sufficient MgO to convert fluorides present to MgF_2 and alumina is added in an amount sufficient to absorb substantially all hydrocarbon liquid present, after which a binder including MgO and KH_2PO_4 is added to the treated nuclear material to form a slurry. Additional MgO may be added. A crystalline radioactive material is also disclosed having a binder of the reaction product of calcined MgO and KH_2PO_4 and a radioactive material of the oxides and/or halides of actinides and/or transuranics (TRUs). Acids contaminated with actinides and/or TRUs, and/or actinides and/or TRUs with or without oils and/or greases may be encapsulated and stabilized by the binder.